

WATER ADSORPTION BY OKENITE ($\text{Ca}_{10}\text{Si}_{18}\text{O}_{46}\cdot 18\text{H}_2\text{O}$) AT AMBIENT TEMPERATURE, Sue I. Martin, Brian E. Viani, and Annemarie Meike, Lawrence Livermore National Laboratory, P.O. Box 808, Livermore, CA

As part of an experimental and modeling program to characterize the effect that cement will have on the water budget at the potential Yucca Mountain repository, water sorption studies of crystalline calcium silicate hydrate phases are being performed. An adsorption study was conducted on okenite ($\text{Ca}_{10}\text{Si}_{18}\text{O}_{46}\cdot 18\text{H}_2\text{O}$) at ambient temperature over a range (3.5-97%) of relative humidity (RH) conditions. A sample of okenite from Poona, India, equilibrated at ambient RH, was divided and dried over phosphorus pentoxide (P_2O_5) and placed in chambers containing saturated salt solutions to control the RH. X-ray diffraction analysis (XRD) indicated that interlamellar swelling occurred along the (001) axis. An increase in the d(001) spacing with hydration was on the order of 2.5\AA at a RH of 11% and remained unchanged at higher RH. This swelling is consistent with a monomolecular water layer in the interlamellar space. Comparison of the XRD peak positions from the 97% RH sample with an undried, natural sample (33% RH) indicates that the interlamellar water adsorption is reversible. A broadening of the XRD peaks after drying the sample over P_2O_5 was noted and the peaks remained broad with subsequent wetting suggesting that the dehydration process caused some disordering. A comparison of the adsorption isotherm with the XRD data allows us to conclude that water adsorbed at 97% RH (11% by weight) included water located within the crystal structure as well as that externally adsorbed and capillary condensate. Future experiments will be performed at elevated temperatures with a sorption system fitted with an evaporator to control the RH and the results will be compared with those at ambient temperature.

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Contact /presenting author:

Sue I. Martin

LLNL

Earth Sciences Division

P.O. Box 808

Livermore, CA 94550

(510) 422-7083

FAX: (510) 423-1057

E-mail: martin25@llnl.gov

Co-author:

Annemarie Meike

LLNL

Earth Sciences Division

P.O. Box 808

Livermore, CA 94550

(510) 422-3735

FAX: (510) 423-1057

E-mail: meike@132.es.llnl.gov

Co-Author:

Brian E. Viani

LLNL

Earth Sciences Division

P.O. Box 808

Livermore, CA 94550

(510) 423-2001

FAX: (510) 422-0208

E-mail: viani@llnl.gov